XVI. *Notes on a large* Heliconine *collection made in French Guiana in* 1917, *compared with a similar collection made in* 1915. By J. J. Joicey, F.E.S., and W. J. Kaye, F.E.S.

[Read November 6th, 1918.]

With Sketch Map.

Perhaps the most striking and interesting point about this great collection is that the percentages both as to the various forms under *melpomene* and under *erato*, and also the ratios of the one species to the other, are found to be in substance the same as those worked out in our previous paper (Trans. Ent. Soc. 1917, pp. 412–431), thus giving confirmation to our published figures. The present collection is four times as large as the one made in 1915, and when slight discrepancies occur in percentages probably the present figures are more correct. Thus in 1915 the number of black hind-winged *melpomene* was 125 out of 731, or 17·53 %, but in the present collection there are only 302 out of 2,935, or 10·29 %, and we think it highly probable that the latter figure is more correct. The red basal streaked section is near enough (54·32 % against 57·03 %) to practically prove that it preponderates over the other two sections combined, while it follows that what the black hind-winged section lost the fully streaked or "thelxiope" hind-wing gained, so that in the present collection the fully-streaked section have 35·39 % instead of 25·44 % in 1915.

The number of *H. melpomene* secured is the very large total of 2,935. They are divided amongst the three sections as follows:—

		mel-pomene.	Percentage of Total.		*mel-pomene*.	Percentage of Total.
Black hind-wing .	1917	302	10·29	1915	125	17·53
Red basal streak .	1917	1,592	54·32	1915	420	57·03
Red basal streak and cross streaks	1917	1,041	35·39	1915	186	25·44
		2,935	100·00		731	100·00

We have heard from Mons. le Moult that the collectors have instructions not to catch typical *melpomene*, and that in his own experience very many more *melpomene* should be estimated for than what we did in our former paper. It is unfortunate that any check was put on the collectors from the scientific standpoint. The remarkable fact, however, remains that of the two collections there is very close agreement, and that, whatever the correct proportion of typical *melpomene* may be, the addition would be approximately the same for both collections. Prof. E. B. Poulton has made the interesting observation to me that probably the *cybele* type of hind-wing with the short red streak would on the wing be much more likely to be mistaken for the all-black hind-wing than the *thelxiope*-streaked hind-wing. It is clear, if this is true, that the fully-streaked forms are in a considerable minority and not at all like Para, where they are practically the only forms found.

Those forms are rarest that represent the most distant geographical races. Thus ab. *penelope* occurs as a race in Bolivia on the Rio Juntas, ab. *rufolimbata* is from the Tapajos River, ab. *timareta* occurs as a race in East Ecuador at Sta Inez and elsewhere. This last form has not yet been seen in the French Guiana collections, but by inference it should occur, even if very rarely, as it is only the representative of *penelope* without any red on fore- or hind-wing. The *penelope* forms graduate into *ricina* forms, the latter occurring as a race on the Upper Amazon at Pebas and Teffe.

Several aberrations are of special interest and afford fresh connecting links. There is one specimen of the *melpina* form, which shows three yellow subapical spots. This suggests at once the spotting of such species (or races of *melpomene*) as *hermogenes* or *galanthus*. Although we have now received in all 3,666 *melpomene* from French Guiana, this is the only specimen showing such spotting.

Three new forms, one of the *cybele* section and two of the *melpomene* section, we think should be named as they are representative of already named similar forms but with different hind-wing. The first, which we call *fairrei*, after Mons. Faivre, is complementary to *negroida* and *negroidens*. A second form of the *melpomene* hind-wing section which we call *compacta* is complementary to *faustalia*

and *rufolimbata*, while the third new form we call *cybeleia*, represents *aglaopeia* with a *cybele* hind-wing.

H. melpomene melpomene ab. **faivrei,** nov.

Fore-wing black with only a dusky yellow half-band at end of cell, edged externally with an almost equal half-band of red. Hind-wing wholly black.

Hab. French Guiana, St. Jean de Maroni.

Type in coll. Joicey.

This form is the same fore-wing form as *negroida* and *negroidens*, but with a black hind-wing.

H. melpomene melpomene ab. **compacta,** nov.

Fore-wing black with a large solid yellow patch around the discocellulars, the veins alone showing black, and with a half-band of red edging the yellow patch externally between costa and vein 4. Hind-wing wholly black.

Hab. French Guiana, St. Jean de Maroni.

Type in coll. Joicey.

This form is the equivalent of *faustalia* and *rufolimbata* as to fore-wing, but with a black hind-wing.

H. melpomene cybele ab. **cybeleia,** nov.

Fore-wing like *aglaopeia*, with the yellow group of spots darkened with blackish. Hind-wing like *cybele*, with the short red basal streak.

Hab. French Guiana, St. Jean de Maroni.

Type in coll. Joicey.

This is the representative of *aglaopeia* with a *cybele* hind-wing.

It is most unfortunate that Staudinger gave the name *aglaopeia* to an insect which is not a bit like *aglaope*. However, as it is well figured in the "Iris" (vol. ix, Pl. V), the form he named *aglaopeia* need never be in doubt. The equivalent form with a black hind-wing has not yet been seen.

A very interesting and suggestive aberration is one of the *melanippe* form showing a trace of a yellow basal

streak along the median vein, thus suggesting the well-developed yellow streak in such races as *nanna* from S. Brazil, and to a lesser extent in *amandus* from E. Bolivia. Many specimens of the black hind-wing section of *melpomene* from F. Guiana show a yellow basal blotch at the submedian, but the extension along the median seems to be very infrequently developed.

There are one or two specimens showing white markings partly in place of yellow, and these our friend Dr. Eltringham will consider, and rightly so, as lending support to his theory that the Colombian and Central American white marked species *cydno*, *galanthus* and *hermogenes* are really races of *melpomene*.

There are four specimens of different fascies all showing a white portion of what would be the true *melpomene* red patch. Thus one is nearly an *aglaopeia*, with what is usually the yellow spot in the cell partly white and partly black scaled.

Another of the *cybele* form has a large circular white spot almost occupying the yellow spot between veins 2 and 3. Two others approximating to the *faustina* form have white, in the one occupying the yellow spaces between veins 5, 6, and 6, 7 on one side, and on the other occupying the costal yellow spot. In the second there is white in the right fore-wing only, within the yellow discoidal spot and within the yellow spots beyond the cell.

The very long series of *erato* is equally variable with the *melpomene*, and is chiefly different from the series made in 1915 in that there are no fewer than 45 of the *tellus* form, which was completely absent in the former collection. There were 5 of the *constricta* form then against 25 of the same form now, while the number of *andremona* forms with a varying amount of white overlaying pattern is much greater in the present series. One of the *erato* (typical) has part of the yellow group of spots in fore-wing white, for this form we propose the name *albida*. The comparatively large number of the *tellus* form emphasises what we said in our former paper, that the streaked forms of *erato* are essentially the models for *melpomene*, as here there are 45 of this form against 6 *melpomene* ab. *penelope* graduating into ab. *vicinus*. In both collections the percentage of streaked forms is very high, and the present collection is a remarkable confirmation of the deduction arrived at from the

1915 collection; for although the collection is eight times the size the percentage of streaked and black hind-winged forms is quite remarkably close.

The total number of *H. erato*, the companion species of the second great division of *Heliconius*, is 1,123. Only 46 of this large number show a black hind-wing. In 1915 the number of black hind-wing forms was 6 out of 155.

		erato.	Per-centage.		*erato.*	Per-centage.
Black hind-wing .	1917	46	4·10	1915	6	3·87
Streaked hind-wing	1917	1,099	95·90	1915	149	95·97
		1,123	100·00		155	100·00

It is difficult, if not nearly impossible, to get a really just set of figures for comparing the darkened fore-wing forms of both *melpomene* and *erato*. *Melpomene* in its *cybele* section and its *thelxiope* section shows completely darkened fore-wing in the forms *funebris* and *stygianus* respectively, but in the all-black hind-wing no wholly blackened fore-wing form has yet occurred, this forming a wholly black insect. In *erato* the form *oberthueri* is the darkest known form from this region, but this shows some slight remnant of the yellow, and there are all gradations up to *resta*. It is thus difficult to know how many *erato* to include, and we fancy we really included too many in our table given at the top of p. 429 of our former paper. Keeping strictly to the VERY DARKEST FORE-WING forms of both species, we get these comparisons:—

Species.		Numbers.	Percentage of Total.		Numbers.	Percentage of Total.
melpomene . .	1917	14	·47	1915	62	8·48
erato	1917	17	1·51	1915	10	6·45

This as a comparison between the two species is probably approximately correct, but it is hardly right to compare the 1915 figures, as we realise we included too many forms which were not sufficiently extreme. The

comparisons between the BLACK HIND-WING forms of the two species are far more satisfactory.

A COMPARISON BETWEEN THE BLACK HIND-WING FORMS OF *MELPOMENE* AND *ERATO*.

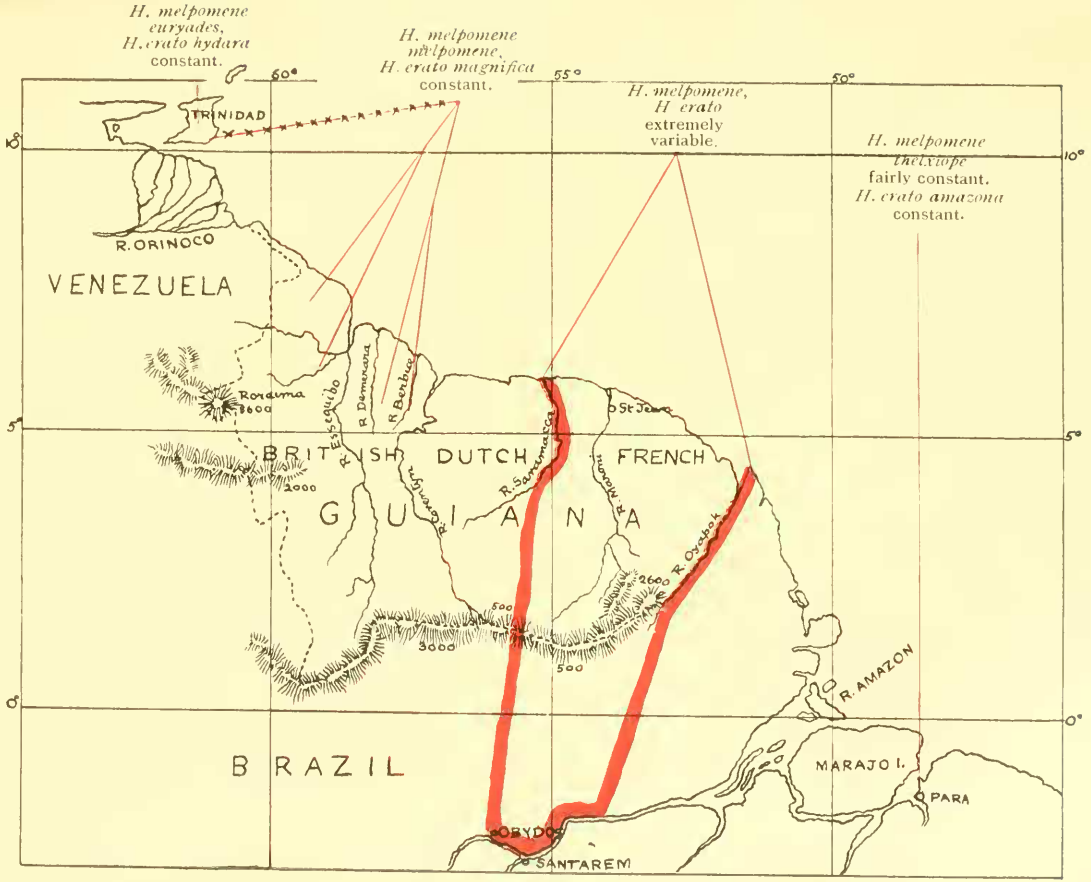
Species.		Numbers with black hind-wing.	Percentage of Total.		Numbers with black hind-wing.	Percentage of Total.
melpomene .	1917	302	10·29	1915	125	17·53
erato . .	1917	46	4·10	1915	6	3·87

A COMPARISON BETWEEN THE STREAKED HIND-WING FORMS OF *MELPOMENE* AND *ERATO*.

Species.		Numbers with streaked hind-wing.	Percentage of Total.		Numbers with streaked hind-wing.	Percentage of Total.
melpomene	1917	1,041	35·39	1915	186	25·44
erato . .	1917	1,077	95·90	1915	149	96·10

We have sketched a map to show the range of distribution of the variable *melpomene* with *erato* in relation to other races of the two species which are more or less constant to the south-east and to the north-west. Thus at Para *melpomene* is present as *thelxiope*, while *erato* occurs as *amazona*, and these two forms are more or less constant. The *erato amazona* is very fixed, while the *melpomene thelxiope* varies only in the amount of yellow spotting, but not to any extent. Only rarely are such forms as *aglaope* to be met with. In British Guiana to the north-west the other extreme is met with. *Melpomene* occurs typically and scarcely varies at all, and incidentally is rather rare, while *erato* is represented by the form *magnifica*, is also very constant, but is very abundant.

Further to the north-west in Trinidad the two species are also constant. *Melpomene* is slightly changed to *eurydes*, while *erato* becomes *hydara* and is constant. Both species are common, but *erato* is a good deal the commoner. The interesting places to get material from now would be east of the Berbice River in British Guiana



Sketch Map of the Guianas showing the range of variable *Heliconius melpomene* with variable *Heliconius erato*, with fixed races to the South-East and to the North-West.